WHAT IS CLAIMED IS:

1. A single crystal spinel boule formed by melt processing, the boule having a non-stoichiometric composition and having a reduced mechanical stress or strain represented by a yield rate not less than about 20%, wherein yield rate is $w_i/(w_i + w_f)$ x 100%, w_i = the number of intact wafers processed from said boule, and w_f = the number of fractured wafers from said boule due to internal mechanical stress or strain in the boule.

2. The boule of claim 1, wherein the yield rate is not less than about 25%.

3. The boule of claim 1, wherein the yield rate is not less than about 30%.

4. The boule of claim 1, wherein the yield rate is not less than about 40%.

5. A single crystal spinel wafer formed by melt processing, the wafer having a non-stoichiometric composition and having a reduced internal stress or strain represented by a yield rate not less than about 20%, wherein yield rate is $w_i/(w_i + w_f)$ x 100%, w_i = the number of intact wafers processed from the boule, and w_f = the number of fractured wafers from the boule due to mechanical stress or strain in the boule.

6. The single crystal spinel wafer of claim 5, wherein the wafer has a diameter of not less than about 1.75 inches.

7. The single crystal spinel wafer of claim 5, wherein the wafer has a diameter of not less than about 2.0 inches.

8. The single crystal spinel wafer of claim 5, wherein the wafer has a diameter of not less than about 2.5 inches.

9. The single crystal spinel wafer of claim 5, wherein the boule consists essentially of a single spinel phase, with substantially no secondary phases.

10. The single crystal spinel wafer of claim 5, wherein the composition is represented by the general formula $aAD \cdot bE_2D_3$, wherein A is selected from the group consisting of Mg, Ca, Zn, Mn, Ba, Sr, Cd, Fe, and combinations thereof, E is selected from the group consisting Al, In, Cr, Sc, Lu, Fe, and combinations thereof, and D is selected from the group consisting O, S, Se, and combinations thereof, wherein a ratio b:a > 1:1 such that the spinel is rich in E_2D_3.

11. The single crystal spinel wafer of claim 10, wherein A is Mg, D is O, and E is Al, such that the single crystal spinel has the formula $aMgO \cdot bAl_2O_3$.

12. The single crystal spinel wafer of claim 10, wherein the ratio b:a is not less than about 1.2:1.

13. The single crystal spinel wafer of claim 10, wherein the ratio b:a is not less than about 1.5:1.

14. The single crystal spinel wafer of claim 10, wherein the ratio b:a is not less than about 2.0:1.

15. The single crystal spinel wafer of claim 10, wherein the ratio b:a is not less than about 2.5:1.

16. The single crystal spinel wafer of claim 10, wherein the ratio b:a is not greater than about 4:1.

17. The single crystal spinel wafer of claim 10, wherein the wafer has a lower mechanical stress and strain compared to stoichiometric spinel.

18. An optoelectronic substrate, consisting essentially of $aMgO \cdot bAl_2O_3$ single crystal spinel, wherein a ratio b:a > 1:1 such that the spinel is rich in Al_2O_3, and the single crystal spinel is formed by a melt process.

19. The substrate of claim 18, wherein the substrate comprises a wafer.

20. The substrate of claim 18, wherein the substrate comprises a die formed from a wafer.

21. The substrate of claim 20, wherein the die is cleaved from the wafer.

22. The substrate of claim 18, wherein the substrate has a surface suitable for epitaxial growth of an active layer thereon.

23. A device, comprising:
a non-stoichiometric spinel substrate formed by melt processing; and
an active layer overlying the substrate.

24. The device of claim 23, wherein the substrate has the general formula $aAD \cdot bE_2D_3$, wherein A is selected from the group consisting of Mg, Ca, Zn, Mn, Ba, Sr, Cd, Fe, and combinations thereof, E is selected from the group consisting Al, In, Cr, Sc, Lu, Fe, and combinations thereof, and D is selected from the group consisting O, S, Se, and combinations thereof, wherein a ratio b:a > 1:1 such that the spinel is rich in E_2D_3.

25. The device of claim 24, wherein A is Mg, D is O, and E is Al, such that the single crystal spinel has the formula $aMgO \bullet bAl_2O_3$.

26. The device of claim 24, wherein the ratio b:a > 1.2:1.

27. The device of claim 24, wherein the ratio b:a < 4.0:1.

28. The device of claim 24, wherein the device is an optoelectronic device selected from the group consisting a laser device and an LED device.

29. The device of claim 28, wherein the device is an LED device, the active layer comprises a nitride semiconductor layer.